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54 Food container.

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## Description

The present invention relates to a food container made of a polyolefin resin composition having a low level of offensive odors and discoloration.

It is a common practice to incorporate a polyolefin with an inorganic filler for the improvement of its stiffness, impact resistance, heat resistance, etc., and some of the filled polyolefins find use as food containers. However, the filled polyolefin poses problems when used for food packaging because of its offensive odors, undesirable color, and decreased heat resistance. The offensive odors are noticeable especially when a full food container is sterilized at a high temperature or heated for cooking in a microwave oven. For this reason, there have been proposed several methods for eliminating offensive odors from food containers of polyolefin resin composition. For example, Japanese Patent Laid-open No. 179943/1988 discloses a food container made of a resin composition composed of (1) 100 parts by weight of a composition composed of 90-20 wt% of polyolefin resin and 10-80 wt% of talc and/or calcium carbonate and (2) 0.05-5 parts by weight of an antistatic agent (such as a polyhydric alcohol ester of fatty acid) and/or a slip agent (such as an unsaturated fatty acid amide). The food container, however, is still unsuccessful in the complete elimination of offensive odors and discoloration.

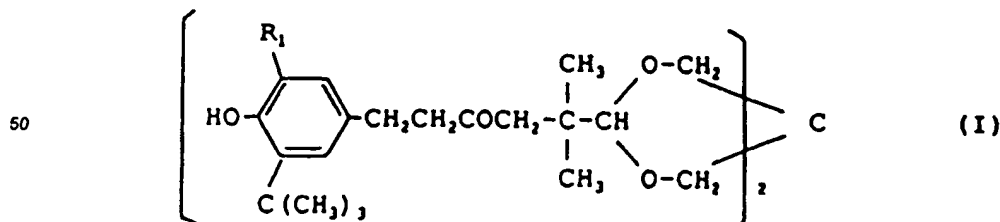
In order to overcome the above-mentioned disadvantages involved in the prior art technology, the present inventors carried out a series of researches which led to a finding that a food container having a low level of offensive odors and discoloration can be obtained from a polyolefin resin composition incorporated with an inorganic filler and a specific phenolic antioxidant and a slip agent and/or antistatic agent.

The investigation by the present inventors revealed that a food container made of a polyolefin composition incorporated with an inorganic filler and an antioxidant gives off offensive odors and becomes discolored when the composition undergoes high-temperature mixing or thermoforming or when the food container is heated. The offensive odors and discoloration result from the reaction of the inorganic filler with the polyolefin and/or antioxidant, which deteriorates the polyolefin and/or decomposes the antioxidant.

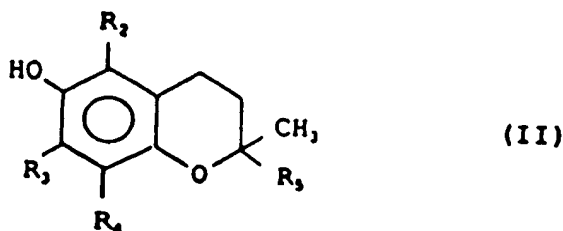
As the result of the investigation, it was found that it is possible to eliminate the offensive odors and discoloration almost completely from the food container, if the polyolefin composition is incorporated with (1) a specific high-performance phenolic antioxidant which prevents the deterioration of polyolefins and hardly reacts with inorganic fillers, or gives off no offensive odors even when decomposed, and (2) a slip agent and/or antistatic agent which suppresses the reaction of the phenolic antioxidant with the inorganic filler. This finding is the basis on which the present invention was completed.

EP-A-0 362 760 is an earlier application according to Article 54(3) EPC and was published between the Applicant's priority dates and its actual date of filing in the EPO. EP-A-0 362 760 discloses polypropylene resin compositions, having improved smell, which comprise polypropylene, an inorganic filler, a phenolic antioxidant, fine powder aggregates of zinc oxide, titanium dioxide and water. The compositions can include various additives such as a glycerin or higher alcohol antistatic agent, nucleating agents, ultraviolet absorbers and stabilizers, heat stabilizers and pigments.

According to the present invention, there is provided a food container of a resin composition composed of 100 parts by weight of a polyolefin and 1-120 parts by weight of an inorganic filler, said resin composition containing (i) 0.01-2.0 parts by weight of a phenolic anti-oxidant for 100 parts by weight of the polyolefin and (ii) 0.01-5.0 parts by weight of a slip agent and/or antistatic agent for 100 parts by weight of the inorganic filler, said phenolic antioxidant being at least one kind selected from  $\beta$ -(4-hydroxy-3-t-butyl-5-alkylphenyl)-propionic acid esters, hindered phenols having an isocyanuric acid esters, 1,3,5-tris-(3,5-di-t-butyl-4-hydroxybenzyl)-2,4,6-trimethylbenzene, phenol compounds represented by the formula (I) below,



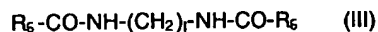
(where R<sub>1</sub> denotes a C<sub>1-3</sub> alkyl group)  
and 6-hydroxychroman compounds represented by the formula (II) below



(where  $R_2$ ,  $R_3$ , and  $R_4$  each independently denotes a hydrogen atom or a  $C_1-4$  alkyl group of the same or different kind; and  $R_5$  denotes a  $C_1-16$  alkyl group or alkylene group);

the inorganic filler is at least one of talc, mica, wollastonite, calcium carbonate, barium sulfate, magnesium carbonate, alumina, silica, synthetic zeolite, glass fiber, carbon black, titanium oxide, magnesium hydroxide, and zeolite;

the slip agent (ii) is selected from compounds represented by the formulas (III) and (IV) below:

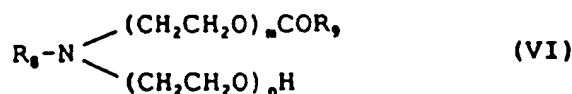
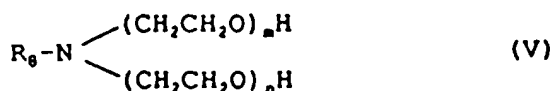


(where  $R_6$  denotes a  $C_5-21$  alkyl group or alkenyl group; and  $l$  denotes 1 to 6)



(where  $R_7$  denotes a  $C_5-21$  alkyl group or alkenyl group.); and

the antistatic agent (ii) is selected from those compounds represented by the formulas (V) and/or (VI) below and also from lower alcohol esters of fatty acid (VII) and polyhydric alcohol esters of fatty acid (VIII).



40 (where  $R_8$  denotes a  $C_8-18$  alkyl group, alkenyl group, or acyl group ( $R'-CO$ ) ( $R'$  in the acyl group may be an unsaturated aliphatic carbon chain);  $m$  and  $n$  are integers defined by  $m + n = 2$  to  $10$ ; and  $R_9$  denotes a  $C_7-17$  alkyl group or alkenyl group.).

#### BRIEF DESCRIPTION OF THE DRAWINGS

45 Fig. 1 is a gas chromatogram pertaining to Example 1 of the present invention.

Fig. 2 is a gas chromatogram pertaining to Comparative Example 1 of the present invention.

Fig. 3 is a gas chromatogram pertaining to Comparative Example 2 of the present invention.

Fig. 4 is a gas chromatogram pertaining to Comparative Example 3 of the present invention.

50 Fig. 5 is a gas chromatogram pertaining to Example 4 of the present invention.

#### DETAILED DESCRIPTION OF THE INVENTION

The invention will be explained in more detail in the following.

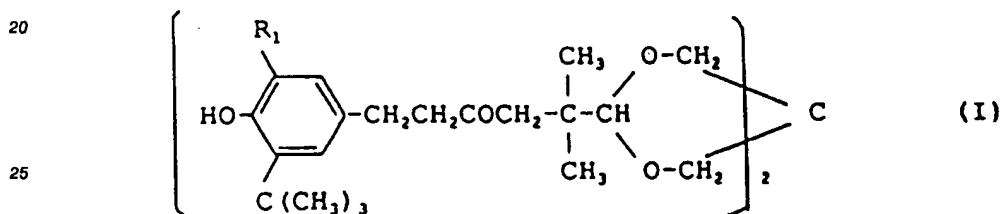
55 The polyolefin used in the present invention is a homopolymer or a random or block copolymer of  $\alpha$ -olefin such as ethylene, propylene, butene-1, hexene-1, and 4-methyl-pentene-1. Examples of the polyolefin include polyethylene, polypropylene, polybutene-1, polyisobutene, poly-3-methyl-butene-1, poly-4-methyl-pentene-1, ethylene-propylene copolymer, ethylene-butene-1 copolymer, propylene-4-methyl-pentene-1

copolymer, propylene-butene-1 copolymer, ethylene-propylene-butene-1 copolymer, and decene-1-4-methyl-pentene-1 copolymer. They may be used alone or in combination with one another. They may also be used in combination with a synthetic rubber according as applications.

The inorganic filler used in the present invention includes, for example, talc, mica, wollastonite, calcium carbonate, barium sulfate, magnesium carbonate, alumina, silica, synthetic zeolite, glass fiber, carbon black, titanium oxide, magnesium hydroxide, and zeolite. They may be used alone or in combination with one another. Preferable among them are talc, mica, calcium carbonate, glass fiber, and wollastonite. Most desirable among them is talc.

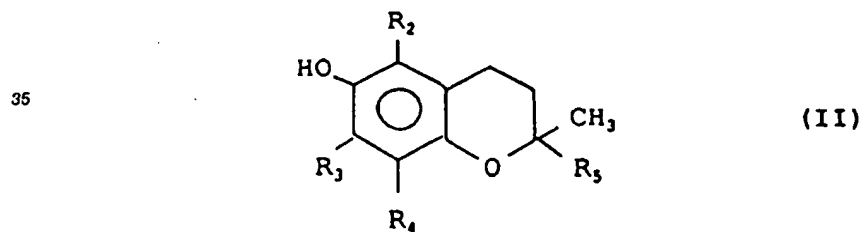
The inorganic filler should be used in an amount of 1-120 parts by weight, preferably 5-100 parts by weight, for 100 parts by weight of polyolefin. With an amount less than 1 part by weight, the inorganic filler does not impart the desired mechanical properties and heat resistnace to the resin composition. With an amount in excess of 120 parts by weight, the inorganic filler makes the resin composition unsuitable for the production of thick-walled containers because of poor thermoformability.

The specific phenolic antioxidant used in the present invention is at least one kind selected from  $\beta$ -(4-hydroxy-3-t-butyl-5-alkylphenyl)propionic acid esters, hindered phenols having an isocyanuric acid ester, 1,3,5-tris(3,5-di-t-butyl-4-hydroxybenzyl)-2,4,6-trimethylbenzene, phenol compounds represented by the formula (I) below,



(where  $\text{R}_1$  denotes a  $\text{C}_1$ - $3$  alkyl group.)

and 6-hydroxychroman compounds represented by the formula (II) below



(where  $\text{R}_2$ ,  $\text{R}_3$ , and  $\text{R}_4$  each independently denotes a hydrogen atom or a  $\text{C}_1$ - $4$  alkyl group of the same or different kind; and  $\text{R}_5$  denotes a  $\text{C}_1$ - $16$  alkyl group or alkylene group.)

Preferred examples of the phenol compound used in the present invention include the following.  
 tetrakis[methylene-3-(3,5-di-t-butyl-4-hydroxyphenyl)-propionate]methane,  
 octadecyl-3-(3,5-di-t-butyl-4-hydroxyphenyl)propionate,  
 1,3,5-tris(3,5-di-t-butyl-4-hydroxybenzyl)-2,4,6-trimethylbenzene,  
 tris(3,5-di-t-butyl-4-hydroxybenzyl)isocyanurate,  
 triethyleneglycol-bis[3-(3-t-butyl-5-methyl-4-hydroxyphenyl)propionate], and  
 3,9-bis[2-[3-(3-t-butyl-4-hydroxy-5-methylphenyl)-propionyloxy]-1,1-dimethylethyl]-2,4,8,10-tetraoxaspiro-[5.5]undecane.

Examples of the 6-hydroxychroman compounds used in the present invention include the following.  
 $\alpha$ -,  $\beta$ -,  $\gamma$ -,  $\delta$ -,  $\epsilon$ -,  $\zeta$ -, and  $\eta$ -tocopherols and mixtures thereof,  
 2,5-dimethyl substitution product, 2,5,8-trimethyl substitution product, and 2,5,7,8-tetramethyl substitution product of 2-(4-methyl-penta-3-enyl)-6-hydroxychroman,  
 2,2,7-trimethyl-5-t-butyl-6-hydroxychroman,  
 2,2,5-trimethyl-7-t-butyl-6-hydroxychroman,  
 2,2,5-trimethyl-6-t-butyl-6-hydroxychroman, and

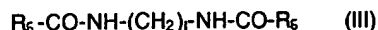
2,2-dimethyl-5-t-butyl-6-hydroxychroman.

Preferable among them are tocopherols and mixtures thereof.

According to the present invention, the phenolic antioxidant should be used in an amount of 0.01-2.0 parts by weight, preferably 0.03-1.0 part by weight, for 100 parts by weight of polyolefin. With an amount in excess of 2.0 parts by weight, the phenolic antioxidant produces adverse effects, such as fuming at the time of molding and bleeding to the container surface. Moreover, using an excess amount of phenolic antioxidant is uneconomical. With an amount less than 0.01 part by weight, the phenolic antioxidant does not produce the desired effect of the present invention.

According to the present invention, the resin composition is incorporated with a slip agent and/or antistatic agent to suppress the reaction between the inorganic filler and the specific phenolic antioxidant.

The slip agent used in the present invention includes those compounds represented by the formulas (III) and (IV) below.



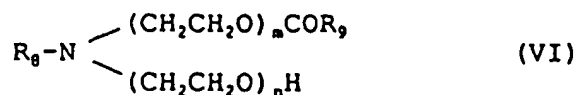
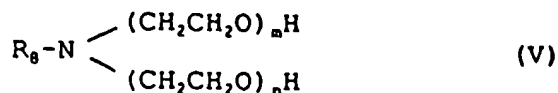
(where  $R_6$  denotes a  $C_{5-21}$  alkyl group or alkenyl group; and  $l$  denotes 1 to 6.)



(where  $R_7$  denotes a  $C_{5-21}$  alkyl group or alkenyl group.)

Preferred examples of the slip agent include methylene-bis-stearamide, ethylene-bis-stearamide, ethylene-bis-oleamide, hexamethylene-bis-stearamide, lauramide, stearamide, oleamide, behenamide, and erucamide. Most desirable among them are saturated fatty acid amides.

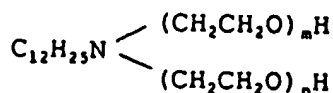
The antistatic agent used in the present invention include those compounds represented by the formulas (V) and/or (VI) below, and it also includes lower alcohol esters of fatty acid (VII) and polyhydric alcohol esters of fatty acid (VIII).



(where  $R_8$  denotes a  $C_{8-18}$  alkyl group, alkenyl group, or acyl group ( $R'-CO$ ) ( $R'$  in the acyl group may be an unsaturated aliphatic carbon chain);  $m$  and  $n$  are integers defined by  $m + n = 2$  to 10; and  $R_9$  denotes a  $C_{7-17}$  alkyl group or alkenyl group.)

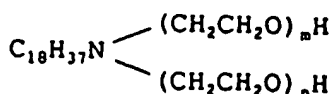
Preferred examples of the antistatic agent are listed below.

(1)



( $m + n = 10$ )

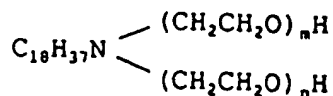
(2)



(m + n = 2)

(3)

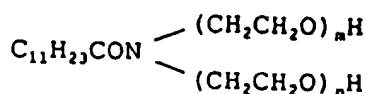
5



(m + n = 10)

10

(4)

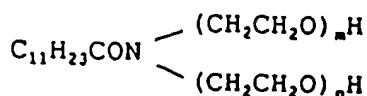


15

(m + n = 2)

(5)

20

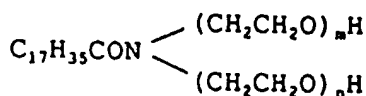


25

(m + n = 10)

(6)

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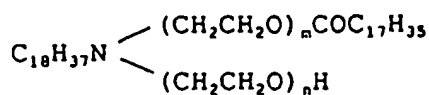


35

(m + n = 2)

(7)

40



(m + n = 2)

45

(8) glycerin monostearate

(9) polyoxyglycerin monostearate

50

According to the present invention, the slip agent and/or antistatic agent should be used in an amount of 0.01-5.0 parts by weight, preferably 0.05-2.0 parts by weight, for 100 parts by weight of the inorganic filler. With an amount in excess of 5.0 parts by weight, the slip agent and/or antistatic agent may give off more offensive odors. Moreover, using the slip agent and/or antistatic agent in an excess amount is uneconomical. With an amount less than 0.01 part by weight, the slip agent and/or antistatic agent does not produce the desired effect of the present invention.

55

The resin composition of the present invention may be incorporated with a phosphorous antioxidant for the improvement of processing stability and thermal-oxidative stability. Examples of the phosphorous antioxidant are listed below.

distearyl pentaerythritol diphosphite,

tris(2,4-di-t-butylphenyl) phosphite,

bis(2,4-di-t-butylphenyl)pentaerythritol diphosphite,

tetrakis (2,4-di-t-butylphenyl)-4,4'-diphenyldiphosphonite, and trinonylphenyl phosphite.

The phosphorous antioxidant should be used in an amount of 0.01-1.0 part by weight, preferably 0.03-0.5 part by weight, for 100 parts by weight of the polyolefin.

5 The resin composition of the present invention may be incorporated with other additives such as neutralizing agent, antioxidant, light stabilizer, UV light absorber, heavy metal deactivator, plasticizer, nucleating agent, antiblocking agent, pigment (including titania), blowing agent, and mildewproofing agent, so long as they have no adverse effects on the feature of the present invention.

The food container of the present invention may be produced in the same manner as ordinary plastics  
10 containers. A common method consists of mixing a polyolefin powder with an inorganic filler, phenolic antioxidant, and slip agent and/or antistatic agent using a Henschel mixer or the like, mixing and pelletizing the mixture using an extruder or Banbury mixer, extruding the pellets into a sheet using a T-die extruder, and thermoforming the sheet into a desired shape. An alternative method consists of forming the pellets directly into containers by injection molding. Another possible method consists of forming a sheet from  
15 pellets containing a blowing agent, expanding the sheet 1.1-20 times, and thermoforming the expanded sheet into containers. Incidentally, the sheet for thermoforming may be replaced by a coextruded multi-layer sheet composed of a layer of the polyolefin resin composition, a layer of polyvinylidene chloride, and a layer of polypropylene or the polyolefin resin composition.

## 20 EXAMPLES

The invention will be described with reference to the following examples and comparative examples, which are not intended to restrict the scope of the invention.

### 25 Example 1

A resin composition was prepared by mixing the following components in a Henschel mixer.

60 parts by weight of homopolypropylene in powder form (having a melt flow index of 0.8 g/10 min),

40 parts by weight of talc,

30 0.2 part by weight of tetrakis[methylene-3-(3,5-di-t-butyl-4-hydroxyphenyl)propionate]methane ("Sumilizer BP-101"),

0.15 part by weight of glycerin monostearate, and

0.05 part by weight of calcium stearate.

The mixture was pelletized using an extruder at 250°C, and the pellets were extruded into a 0.6-mm  
35 thick sheet using a T-die extruder. The sheet was thermoformed into a container, 16 cm long, 10 cm wide, and 2.5 cm deep.

The container was cut into small pieces (several millimeters square). The small pieces (10 g) were placed in a 200-ml stoppered glass bottle. The bottle was heated in an oven at 150°C for 10 minutes, followed by conditioning at 60°C for 30 minutes. Immediately after removal from the oven, the bottle was  
40 opened and the air therein was tested for offensive odors.

The intensity of offensive odors was rated in five ranks (1 to 5) by five panelists according to the following criterion. The container was rated at 2.4 in terms of an average of five values.

1 : very weak (hardly smells)

2 : weak (slightly smells)

45 3 : medium (apparently smells)

4 : strong (strongly smells)

5 : very strong (intolerably smells)

The cut pieces of the container were taken out from the glass bottle and they were tested for yellowness index according to JIS K7103. A YI value of 5 was obtained. The smaller the YI value, the better  
50 the color.

The food container was also tested for the volatile components it gives off when heated at 150°C. The test was carried out in the following manner using a full automatic head space analyzing system consisting of a gas chromatograph (GC-9APF) and head space sampler (HSS-2A), both made by Shimadzu Seisakusho, Ltd.

55 (1) The sample container was cut into small pieces (several millimeters square), and the cut pieces (0.5 g) were placed in a 20-ml glass bottle (vial) under a nitrogen stream. The glass bottle was set on the head space sampler.

(2) The glass bottle was heated at 150 °C for 60 minutes, and then a sample gas (0.8 ml) was taken from the glass bottle.

(3) The sample gas was analyzed by gas chromatography under the following conditions.

Column: HiCap-CBP1 (0.25 mm in inside diameter, 25 m long, made by Shimadzu Seisakusho, Ltd.)

5 Column temperature: 60 °C to 230 °C raised at a rate of 5 °C/min (temperature-programmed chromatography)

Injection temperature: 300 °C

Detection temperature: 300 °C

Carrier gas: He

10 The results of measurement are shown in Fig. 1. It is noted that volatile components (decomposition components) were hardly detected.

#### Comparative Example 1

15 The same procedure as in Example 1 was repeated except that the resin composition was not incorporated with glycerin monostearate. The results are shown in Table 1. The resulting container was tested for volatile components. A large amount of volatile components (decomposition components) was detected as shown in Fig. 2. This corresponds well to the high intensity of offensive odors.

#### 20 Comparative Example 2

The same procedure as in Example 1 was repeated except that tetrakis[methylene-3-(3,5-di-t-butyl-4-hydroxyphenyl)propionate]methane was replaced by 2,6-di-t-butyl-4-methylphenol ("Sumilizer BHT" made by Sumitomo Chemical Co., Ltd.). The results are shown in Table 1. The resulting container was tested for  
25 volatile components. A large amount of volatile components (decomposition components) was detected as shown in Fig. 3. This corresponds well to the high intensity of offensive odors.

#### Comparative Example 3

30 The same procedure as in Example 1 was repeated except that 0.2 part by weight of tetrakis-[methylene-3-(3,5-di-t-butyl-4-hydroxyphenyl)propionate]methane was replaced by 0.1 part by weight each of tetrakis[methylene-3-(3,5-di-t-butyl-4-hydroxyphenyl)propionate]methane and 2,6-di-t-butyl-4-methylphenol. The results are shown in Table 1. The resulting container was tested for volatile components. A large amount of volatile components (decomposition components) was detected as shown in Fig. 4. This  
35 corresponds well to the high intensity of offensive odors.

#### Example 2

The same procedure as in Example 1 was repeated except that glycerin monostearate was replaced by  
40 ethylene-bis-stearamide. The results are shown in Table 1. The resulting container was tested for volatile components. Volatile components were hardly detected as shown in Fig. 5.

#### Example 3

45 The same procedure as in Example 1 was repeated except that the resin composition was prepared from the following components.

80 parts by weight of homopolypropylene in powder form.

20 parts by weight of talc,

0.2 part by weight of tris-(3,5-di-t-butyl-4-hydroxybenzyl) isocyanurate,

50 0.1 part by weight of ethylene-bis-stearamide, and

0.05 part by weight of calcium stearate.

The results are shown in Table 1.

#### Examples 4 to 6

55 The same procedure as in Example 3 was repeated except that the slip agent and antistatic agent were replaced by those of different kind. The results are shown in Table 1.



Examples 7 and 8

The same procedure as in Example 3 was repeated except that the phenolic antioxidant was replaced by that of different kind. The results are shown in Table 1.

Example 9

The same procedure as in Example 3 was repeated except that the talc was replaced by calcium carbonate. The results are shown in Table 1.

Comparative Example 4

The same procedure as in Example 3 was repeated except that the resin composition was not incorporated with ethylene-bis-stearamide. The results are shown in Table 1.

Example 10

A resin composition was prepared by mixing the following components in a Henschel mixer.  
60 parts by weight of homopolypropylene in powder form (having a melt flow index of 0.8 g/10 min),  
40 parts by weight of talc,  
0.05 part by weight of dl- $\alpha$ -tocopherol,  
0.15 part by weight of glycerin monostearate, and  
0.05 part by weight of calcium stearate.

The mixture underwent the same steps as in Example 1, and the resulting container was tested for offensive odors. The intensity of offensive odors was rated at 2.6.

Comparative Example 5

The same procedure as in Example 10 was repeated except that the resin composition was not incorporated with glycerin monostearate. The results are shown in Table 2.

Comparative Example 6

The same procedure as in Example 10 was repeated except that dl- $\alpha$ -tocopherol was replaced by 2,6-di-t-butyl-4-methylphenol. The results are shown in Table 2.

Examples 11 to 14

The same procedure as in Example 10 was repeated except that the slip agent and antistatic agent were replaced by those of different kind. The results are shown in Table 2.

Comparative Example 7

The same procedure as in Example 10 was repeated except that dl- $\alpha$ -tocopherol was replaced by 2,6-di-t-butyl-4-methylphenol and tetrakis-[methylene-3-(3,5-di-t-butyl-4-hydroxyphenyl)propionate]-methane. The results are shown in Table 2.

It is noted from Tables 1 and 2 that the food container of the present invention is almost free of offensive odors and discoloration when it is made of a polyolefin resin composition incorporated with an inorganic filler, a specific phenolic antioxidant, and a slip agent and/or antistatic agent. The food container is suitable for sterilization at a high temperature or for heating in a microwave oven.

Table I

Example No. (Comparative Example No.)	Resin composition (parts by weight)										Offensive odors #2	YI value of container
	Polyolefin		Inorganic filler		Phenolic antioxidant		Slip or antistatic agent					
					Kind	Amount added	Kind	Amount added				
1	PP	60	Talc	40	A-1	0.2	B-1	0.10		2.4	5	
2	PP	60	Talc	40	A-1	0.2	B-2	0.10		2.0	0	
3	PP	80	Talc	20	A-2	0.2	B-2	0.10		1.4	-8	
4	PP	80	Talc	20	A-2	0.2	B-3	0.10		1.6	-6	
5	PP	80	Talc	20	A-2	0.2	B-4	0.10		1.4	-8	
6	PP	80	Talc	20	A-2	0.2	B-5	0.10		1.6	-6	
7	PP	80	Talc	20	A-3	0.2	B-2	0.10		1.4	-8	
8	PP	80	Talc	20	A-4	0.2	B-2	0.10		1.4	-10	
9	PP	80	CaCO <sub>3</sub>	20	A-2	0.2	B-2	0.10		1.2	-12	
(1)	PP	60	Talc	40	A-1	0.2	-	-		4.0	15	
(2)	PP	60	Talc	40	A-5	0.2	B-1	0.10		4.8	10	
(3)	PP	60	Talc	40	A-1	0.1	B-1	0.10		4.4	8	
					A-5	0.1						
(4)	PP	80	Talc	20	A-2	0.2	-	-		3.8	1	

Note to Table 1

\*1 ... Polypropylene

\*2 ... An average value of the intensity of offensive odors the container gives off.

A-1 : tetrakis[methylene-3-(3,5-di-t-butyl-4-hydroxyphenyl)propionate]methane

A-2 : tris(3,5-di-t-butyl-4-hydroxybenzyl)isocyanurate, ("Irganox 1330")

A-3 : 1,3,5-tris(3,5-di-t-butyl-4-hydroxybenzyl)-2,4,6-trimethylbenzene ("Irganox 3114")

A-4 : 3,9-bis[2-[3-(3-t-butyl-4-hydroxy-5-methylphenyl)-propionyloxy]-1,1-dimethylethyl]-2,4,8,10-tetraoxa-spiro[5.5]undecane ("Sumilizer GA-80" made by Sumitomo Chemical Co., Ltd.)

A-5 : 2,6-di-t-butyl-4-methylphenol ("Sumilizer BHT" made by Sumitomo Chemical Co., Ltd.)

B-1 : glycerin monostearate

B-2 : ethylene-bis-stearamide

B-3 : erucamide

B-4 : behenamide

B-5 : stearyl diethanolamine monostearate

Table 2

Example No. (Comparative Example No.)	Resin composition (parts by weight)								Offensive odors <sup>#2</sup>
	Polyolefin		Inorganic filler		Phenolic antioxidant		Slip or antistatic agent		
Kind	Amount added	Kind	Amount added	Kind	Amount added	Kind	Amount added		
10	PP <sup>#1</sup>	60	Talc	40	A-6	0.05	B-1	0.10	2.6
11	PP	60	Talc	40	A-6	0.05	B-2	0.10	2.2
12	PP	60	Talc	40	A-6	0.05	B-3	0.10	2.4
13	PP	60	Talc	40	A-6	0.05	B-4	0.10	2.2
14	PP	60	Talc	40	A-6	0.05	B-5	0.10	2.4
(5)	PP	60	Talc	40	A-6	0.05	-	-	4.0
(6)	PP	60	Talc	40	A-5	0.05	B-1	0.10	4.8
(7)	PP	60	Talc	40	A-5 A-1	0.05 0.05	B-1	0.10	4.6

## Note to Table 2

\*1 ... Polypropylene

\*2 ... An average value of the intensity of offensive odors the container gives off.

A-1 : tetrakis[methylene-3-(3,5-di-t-butyl-4-hydroxy-phenyl)propionate]methane

A-5 : 2,6-di-t-butyl-4-methylphenol

A-6 : dl- $\alpha$ -tocopherol

B-1 : glycerin monostearate

B-2 : ethylene-bis-stearamide

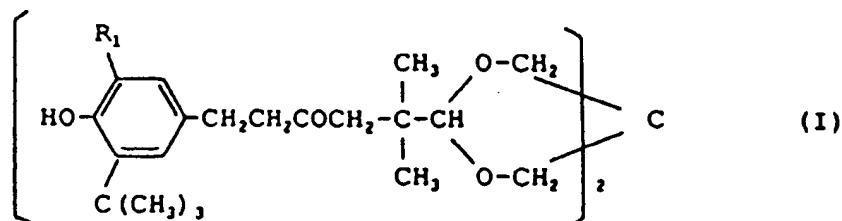
B-3 : erucamide

B-4 : behenamide

B-5 : stearyl diethanolamine monostearate

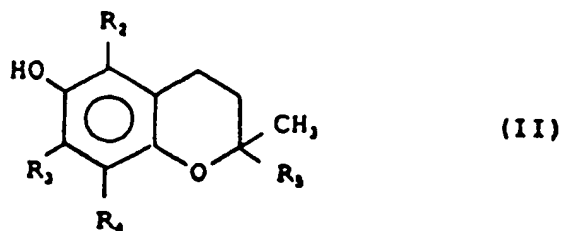
## 30 Claims

1. A food container of a resin composition composed of 100 parts by weight of a polyolefin and 1-120 parts by weight of an inorganic filler, said resin composition containing (i) 0.01-2.0 parts by weight of a phenolic anti-oxidant for 100 parts by weight of the polyolefin and (ii) 0.01-5.0 parts by weight of a slip agent and/or antistatic agent for 100 parts by weight of the inorganic filler, said phenolic antioxidant being at least one kind selected from  $\beta$ -(4-hydroxy-3-t-butyl-5-alkylphenyl)-propionic acid esters, hindered phenols having an isocyanuric acid esters, 1,3,5-tris-(3,5-di-t-butyl-4-hydroxy-benzyl)-2,4,6-trimethylbenzene, phenol compounds represented by the formula (I) below,



(where R<sub>1</sub> denotes a C<sub>1-3</sub> alkyl group)

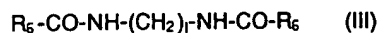
and 6-hydroxychroman compounds represented by the formula (II) below



10 (where  $R_2$ ,  $R_3$ , and  $R_4$  each independently denotes a hydrogen atom or a  $C_{1-4}$  alkyl group of the same or different kind; and  $R_5$  denotes a  $C_{1-16}$  alkyl group or alkylene group);

the inorganic filler is at least one of talc, mica, wollastonite, calcium carbonate, barium sulfate, magnesium carbonate, alumina, silica, synthetic zeolite, glass fiber, carbon black, titanium oxide, magnesium hydroxide, and zeolite;

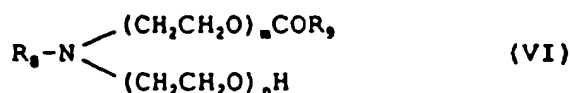
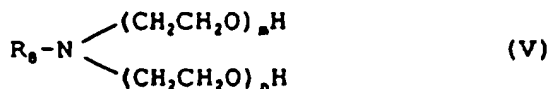
15 the slip agent (ii) is selected from compounds represented by the formulas (III) and (IV) below:



20 (where  $R_6$  denotes a  $C_{5-21}$  alkyl group or alkenyl group; and  $l$  denotes 1 to 6)



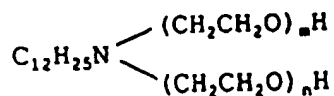
25 (where  $R_7$  denotes a  $C_{5-21}$  alkyl group or alkenyl group.) ; and the antistatic agent (ii) is selected from those compounds represented by the formulas (V) and/or (VI) below and also from lower alcohol esters of fatty acid (VII) and polyhydric alcohol esters of fatty acid (VIII).



40 (where  $R_8$  denotes a  $C_{8-18}$  alkyl group, alkenyl group, or acyl group ( $R'-CO$ ) ( $R'$  in the acyl group may be an unsaturated aliphatic carbon chain);  $m$  and  $n$  are integers defined by  $m + n = 2$  to  $10$ ; and  $R_9$  denotes a  $C_{7-17}$  alkyl group or alkenyl group.).

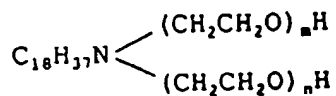
2. A food container as claimed in Claim 1, wherein the resin composition further contains 0.01-1.0 part by weight of a phosphorous antioxidant for 100 parts by weight of the polyolefin.
3. A food container as claimed in Claim 1 or 2, wherein the polyolefin is a homopolymer or a random or block copolymer of  $\alpha$ -olefins or a mixture thereof or a mixture thereof in combination with a synthetic rubber.
4. A food container as claimed in Claim 1 or 2, wherein the  $\beta$ -(4-hydroxy-3-*t*-butyl-5-alkylphenyl)propionic acid esters include:  
tetrakis[methylene-3-(3,5-di-*t*-butyl-4-hydroxyphenyl)propionate]methane,  
octadecyl-3-(3,5-di-*t*-butyl-4-hydroxyphenyl)propionate, and  
triethyleneglycol-bis[3-(3-*t*-butyl-5-methyl-4-hydroxyphenyl)propionate].
5. A food container as claimed in Claim 1 or 2, wherein the hindered phenols having an isocyanuric acid ester (i) is tris(3,5-di-*t*-butyl-4-hydroxybenzyl)isocyanurate.

6. A food container as claimed in Claim 1 or 2, wherein the phenol compound represented by the formula (I) is 3,9-bis[2-[3-(3-t-butyl-4-hydroxy-5-methylphenyl)propionyloxy]-1,1-dimethylethyl]-2,4,8,10-tetraoxaspiro[5.5]undecane.
7. A food container as claimed in Claim 1 or 2, wherein the 6-hydroxychroman compounds represented by the formula (II) include:  
 $\alpha$ -,  $\beta$ -,  $\gamma$ -,  $\delta$ -,  $\epsilon$ -,  $\zeta$ -, and  $\eta$ -tocopherols and mixtures thereof,  
 2,5-dimethyl substitution product, 2,5,8-trimethyl substitution product, and 2,5,7,8-tetramethyl substitution product of 2-(4-methyl-penta-3-enyl)-6-hydroxychroman,  
 2,2,7-trimethyl-5-t-butyl-6-hydroxychroman,  
 2,2,5-trimethyl-7-t-butyl-6-hydroxychroman,  
 2,2,5-trimethyl-6-t-butyl-6-hydroxychroman, and  
 2,2-dimethyl-5-t-butyl-6-hydroxychroman.
8. A food container as claimed in Claim 1, wherein the slip agent (ii) includes methylene-bis-stearamide, ethylene-bis-stearamide, ethylene-bis-oleamide, hexamethylene-bis-stearamide, lauramide, stearamide, oleamide, behenamide, and erucamide.
9. A food container as claimed in Claim 1, wherein the antistatic agent (ii) includes:



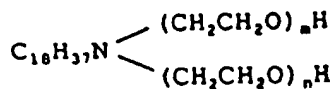
$$(m + n = 10)$$

(2)



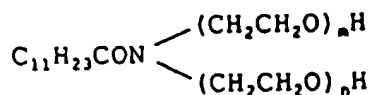
$$(m + n = 2)$$

(3)



$$(m + n = 10)$$

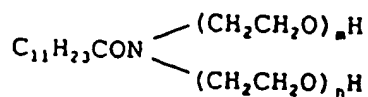
(4)



$$(m + n = 2)$$

(5)

5

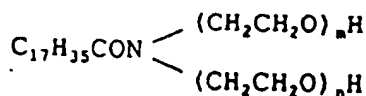


10

(m + n = 10)

(6)

15

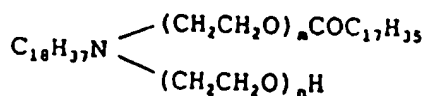


20

(m + n = 2)

(7)

25



(m + n = 2)

(8) glycerin monostearate, and

(9) polyoxyglycerin monostearate.

## 30 Patentansprüche

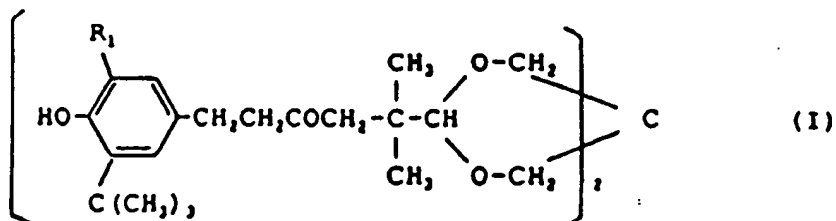
1. Nahrungsmittelbehälter aus einer Harzzusammensetzung bestehend aus 100 Gewichtsteilen eines Polyolefins und 1-120 Gewichtsteilen eines anorganischen Füllstoffes, wobei die Harzzusammensetzung enthält

35 (i) 0,01-2,0 Gewichtsteile eines phenolischen Antioxidationsmittels pro 100 Gewichtsteile des Polyolefins und

40 (ii) 0,01-5,0 Gewichtsteile eines Gleitmittels und/oder antistatischen Mittels pro 100 Gewichtsteile des anorganischen Füllstoffes, wobei das phenolische Antioxidationsmittel zumindest eines ist ausgewählt aus  $\beta$ -(4-Hydroxy-3-t-butyl-5-alkylphenyl)-propionsäureester, gehinderten Phenolen mit einem Isocyanursäure ester, 1,3,5-Tris-(3,5-di-t-butyl-4-hydroxy-benzyl)-2,4,6-trimethylbenzol, Phenolverbindungen, die durch die nachfolgende Formel (I) repräsentiert werden

45

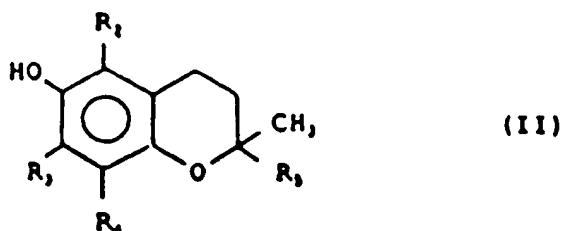
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worin  $R_1$  eine  $C_1$ - $C_3$ -Alkylgruppe bedeutet und 6-Hydroxy-chromanverbindungen, die durch die nachfolgende Formel (II) repräsentiert werden

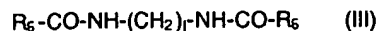




10 (worin  $R_2$ ,  $R_3$  und  $R_4$  jeweils unabhängig ein Wasserstoffatom oder eine  $C_{1-4}$ -Alkylgruppe der gleichen oder unterschiedlicher Art bezeichnet und  $R_5$  eine  $C_{1-16}$ -Alkylgruppe oder Alkylengruppe darstellt;

15 der anorganische Füllstoff wenigstens ein solcher ist, der aus Talk, Mica, Wollastonit, Calciumcarbonat, Bariumsulfat, Magnesiumcarbonat, Aluminiumoxid, Siliciumdioxid, synthetischem Zeolit, Glasfasern, Ruß, Titanoxid, Magnesiumhydroxid und Zeolit besteht;

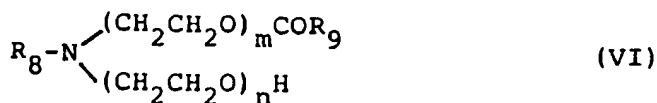
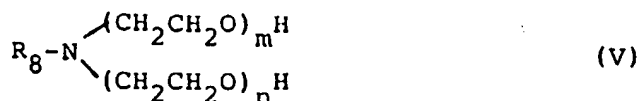
das Gleitmittel (ii) ausgewählt ist aus Verbindungen, die durch die nachfolgenden Formeln (III) und (IV) repräsentiert werden



(worin  $R_6$  eine  $C_5-21$ -Alkylgruppe oder Alkenylgruppe bezeichnet und  $l$  1 bis 6 bedeutet)



(worin  $R_7$  eine  $C_5-21$ -Alkylgruppe oder Alkenylgruppe darstellt); und das antistatische Mittel (ii) ausgewählt ist aus solchen Verbindungen, die durch die nachfolgenden Formeln (V) und/oder (VI) repräsentiert werden und auch aus niederen Alkoholestern der Fettsäure (VII) und mehrwertigen Alkoholestern der Fettsäure (VIII).



40 (worin  $R_8$  eine  $C_8-18$ -Alkylgruppe, Alkenylgruppe oder Acylgruppe ( $R'-CO$ ) darstellt ( $R'$  kann in der Acylgruppe eine ungesättigte aliphatische Kohlenstoffkette sein);  $m$  und  $n$  sind ganze Zahlen, die definiert werden durch  $m + n = 2$  bis 10; und  $R_9$  bezeichnet eine  $C_7-17$ -Alkylgruppe oder Alkenylgruppe).

2. Nahrungsmittelbehälter nach Anspruch 1, worin die Harzzusammensetzung weiterhin 0,01-1,0 Gewichtsteile eines Phosphorantioxidationsmittels pro 100 Gewichtsteile des Polyolefins enthält.

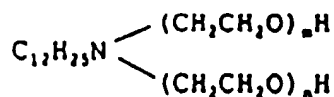
3. Nahrungsmittelbehälter nach Anspruch 1 oder 2, worin das Polyolefin ein Homopolymer oder ein willkürliches oder Block-Copolymer von -Olefinen oder eine Mischung derselben oder eine Mischung derselben in Kombination mit einem synthetischen Gummi ist.

4. Nahrungsmittelbehälter nach Anspruch 1 oder 2, worin die  $\beta$ -(4-Hydroxy-3-t-butyl-5-alkylphenyl)-propionsäureester umfassen:  
Tetrakis[methylen-3-(3,5-di-t-butyl-4-hydroxyphenyl)propionat]-methan,  
Octadecyl-3-(3,5-di-t-butyl-4-hydroxyphenyl)propionat, und

Triethylenglycol-bis[3-(3-t-butyl-5-methyl-4-hydroxyphenyl)propionat].

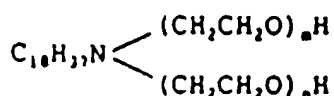
5. Nahrungsmittelbehälter nach Anspruch 1 oder 2, worin die gehinderten Phenole einen Isocyanursäureester (i) aufweisen, der Tris(3,5-di-t-butyl-4-hydroxybenzyl)-isocyanurat ist.
6. Nahrungsmittelbehälter nach Anspruch 1 oder 2, worin die durch die Formel (I) repräsentierte Phenol-  
verbindung 3,9-Bis[2-[3-(3-t-butyl-4-hydroxy-5-methylphenyl)propionyloxy]-1,1-dimethylethyl]-2,4,8,10-  
tetraoxa-spiro-[5,5]-undecan ist.
7. Nahrungsmittelbehälter nach Anspruch 1 oder 2, worin die 6-Hydroxychromanverbindungen, die durch  
die Formel (II) repräsentiert werden, umfassen:  
α-, β-, γ-, δ-, ε-, ζ- und η-Tocopherole und Mischungen derselben,  
das 2,5-Dimethyl-Substitutionsprodukt, das 2,5,8-Trimethyl-Substitutionsprodukt und das 2,5,7,8-Tetra-  
methyl-Substitutionsprodukt von 2-(4-Methyl-penta-3-enyl)-6-hydroxychroman,  
2,2,7-Trimethyl-5-t-butyl-6-hydroxychroman,  
2,2,5-Trimethyl-7-t-butyl-6-hydroxychroman,  
2,2,5-Trimethyl-6-t-butyl-6-hydroxychroman und  
2,2-Dimethyl-5-t-butyl-6-hydroxychroman.
8. Nahrungsmittelbehälter nach Anspruch 1, worin das Gleitmittel (ii) Methylen-bis-stearamid, Ethylen-bis-  
stearamid, Ethylen-bis-oleamid, Hexamethylen-bis-stearamid, Lauramid, Stearamid, Oleamid, Behena-  
mid und Erucamid umfaßt.
9. Nahrungsmittelbehälter nach Anspruch 1, worin das antistatische Mittel (ii) umfaßt:

(1)



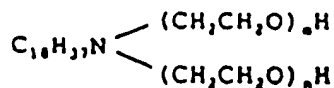
(m + n = 10)

(2)



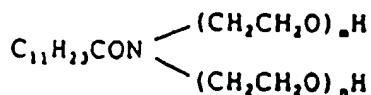
(m + n = 2)

(3)



(m + n = 10)

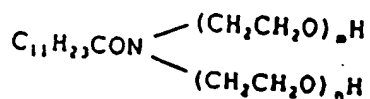
(4)



(m + n = 2)

(5)

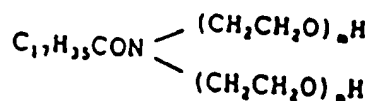
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(m + n = 10)

10

(6)

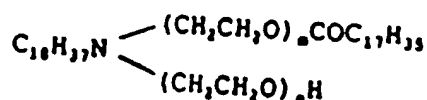


15

(m + n = 2)

(7)

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25

(m + n = 2)

(8) Glycerinmonostearat und

(9) Polyoxyglycerinmonostearat.

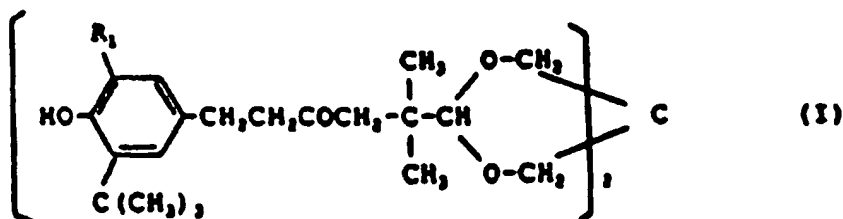
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# Revendications

1. Récipient pour aliments en une composition de résine constituée par 100 parties en poids d'une polyoléfine et 1-120 parties en poids d'une charge inorganique, ladite composition de résine contenant
  - (i) 0,01-2,0 parties en poids d'un antioxydant phénolique pour 100 parties en poids de la polyoléfine et
  - (ii) 0,01-5,0 parties en poids d'un agent de glissement et/ou d'un agent antistatique pour 100 parties en poids de la charge inorganique, ledit antioxydant phénolique étant au moins un corps choisi parmi des esters d'acide  $\beta$ -(4-hydroxy-3-t-butyl-5-alkylphényl)-propionique, des phénols empêchés comportant un groupement ester d'acide isocyanurique, le 1,3,5-tris-(3,5-di-t-butyl-4-hydroxybenzyl)-2,4,6-triméthylbenzène, des composés phénoliques représentés par la formule (I) suivante

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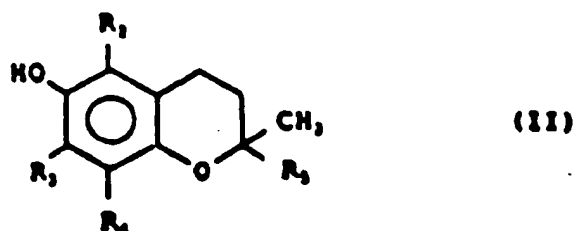


50

(où R<sub>1</sub> représente un groupement alkyle en C<sub>1</sub>-C<sub>3</sub>)

et des dérivés du 6-hydroxychromane représentés par la formule (II) suivante

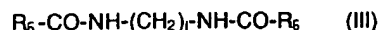
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10 (où R<sub>2</sub>, R<sub>3</sub> et R<sub>4</sub> représentent chacun, indépendamment les uns des autres, un atome d'hydrogène ou un groupement alkyle en C<sub>1</sub>-C<sub>4</sub> de type identique ou différent; et R<sub>5</sub> représente un groupement alkyle en C<sub>1</sub>-C<sub>16</sub> ou un groupement alkylène);

15 la charge inorganique est l'une au moins parmi le talc, le mica, la wollastonite, le carbonate de calcium, le sulfate de baryum, le carbonate de magnésium, l'alumine, la silice, la zéolithe synthétique, les fibres de verre, le noir de carbone, l'oxyde de titane, l'hydroxyde de magnésium et la zéolithe;

l'agent de glissement (ii) est choisi parmi des composés représentés par les formules (III) et (IV) suivantes

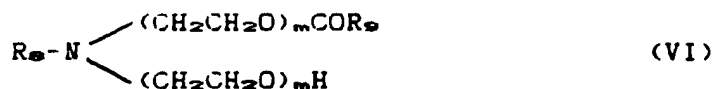
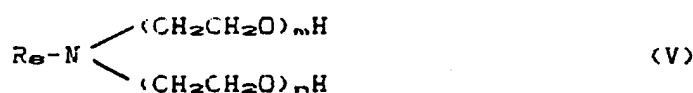


(où R<sub>6</sub> représente un groupement alkyle en C<sub>5</sub>-C<sub>21</sub> ou un groupement alcényle; et l est mis pour un nombre de 1 à 6)



(où R<sub>7</sub> représente un groupement alkyle en C<sub>5</sub>-C<sub>21</sub> ou un groupement alcényle; et

l'agent antistatique (ii) est choisi parmi les composés représentés par les formules (V) et/ou (VI) suivantes, ainsi que parmi des esters d'alcools inférieurs et d'acides gras (VII) et des esters d'alcools polyatomiques et d'acides gras (VIII)



45 (où R<sub>8</sub> représente un groupement alkyle en C<sub>8</sub>-C<sub>18</sub>, un groupement alcényle ou un groupement acyle (R'-CO) [R' dans le groupement acyle peut être une chaîne carbonée aliphatique insaturée]; m et n sont des nombres entiers définis par m + n = 2 à 10; et R<sub>9</sub> représente un groupement alkyle en C<sub>7</sub>-C<sub>17</sub> ou un groupement alcényle).

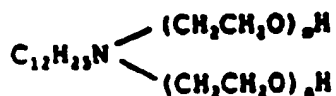
2. Récipient pour aliments selon la revendication 1, dans lequel la composition de résine contient en outre 0,01-1,0 partie en poids d'un antioxydant phosphoreux pour 100 parties en poids de la polyoléfine.

50 3. Récipient pour aliments selon la revendication 1 ou 2, dans lequel la polyoléfine est un homopolymère ou un copolymère statistique ou séquencé d' $\alpha$ -oléfines, un mélange de ceux-ci ou un mélange de ceux-ci en combinaison avec un caoutchouc synthétique.

4. Récipient pour aliments selon la revendication 1 ou 2, dans lequel les esters d'acide  $\beta$ -(4-hydroxy-3-t-butyl-5-alkylphényl)-propionique comprennent:  
 55 le tétrakis[méthylène-3-(3,5-di-t-butyl-4-hydroxyphényl)-propionate]méthane,  
 le 3-(3,5-di-t-butyl-4-hydroxyphényl)propionate d'octadécyle et  
 le bis[3-(3-t-butyl-5-méthyl-4-hydroxyphényl)propionate] de triéthylèneglycol.

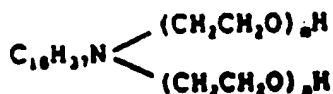
5. Récipient pour aliments selon la revendication 1 ou 2, dans laquelle le phénol empêché comportant un groupement ester d'acide isocyanurique (i) est l'isocyanurate de tris(3,5-di-t-butyl-4-hydroxybenzyle).
6. Récipient pour aliments selon la revendication 1 ou 2, dans lequel le composé phénolique représenté par la formule (I) est le 3,9-bis{2-[3-(3-t-butyl-4-hydroxy-5-méthylphenyl)-propionyloxy]-1,1-diméthyléthyl}-2,4,8,10-tétraoxaspiro[5.5]undecane.
7. Récipient pour aliments selon la revendication 1 ou 2, dans lequel les dérivés de 6-hydroxychromane représentés par la formule (II) comprennent les  $\alpha$ -,  $\beta$ -,  $\gamma$ -,  $\delta$ -,  $\epsilon$ -,  $\zeta$ - et  $\eta$ -tocophérols et des mélanges de ceux-ci, un produit de substitution par 2,5-diméthyle, un produit de substitution par 2,5,8-triméthyle et un produit de substitution par 2,5,7,8-tétraméthyle de 2-(4-méthylpenta-3-ényl)-6-hydroxychromane, le 2,2,7-triméthyl-5-t-butyl-6-hydroxychromane, le 2,2,5-triméthyl-7-t-butyl-6-hydroxychromane, le 2,2,5-triméthyl-6-t-butyl-6-hydroxychromane et le 2,2-diméthyl-5-t-butyl-6-hydroxychromane.
8. Récipient pour aliments selon la revendication 1, dans lequel l'agent de glissement (ii) comprend le méthylène-bis-stéaramide, l'éthylène-bis-stéaramide, l'éthylène-bis-oléamide, l'hexaméthylène-bis-stéaramide, le lauramide, le stéaramide, l'oléamide, le béhénamide et l'érucamide.
9. Récipient pour aliments selon la revendication 1, dans lequel l'agent antistatique (ii) comprend

(1)



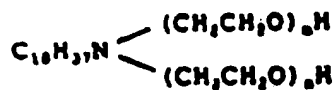
(m + n = 10)

(2)



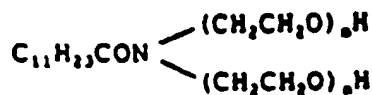
(m + n = 2)

(3)



(m + n = 10)

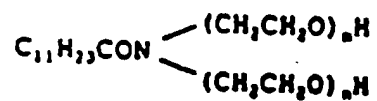
(4)



(m + n = 2)

(5)

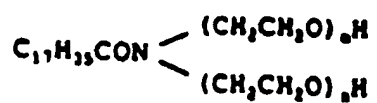
5



(m + n = 10)

10

(6)

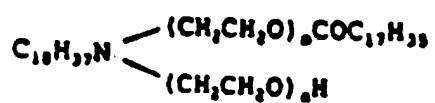


15

(m + n = 2)

20

(7)



25

(m + n = 2)

(8) le monostearate de glycérol et

(9) le monostearate de polyoxyglycérol.

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45

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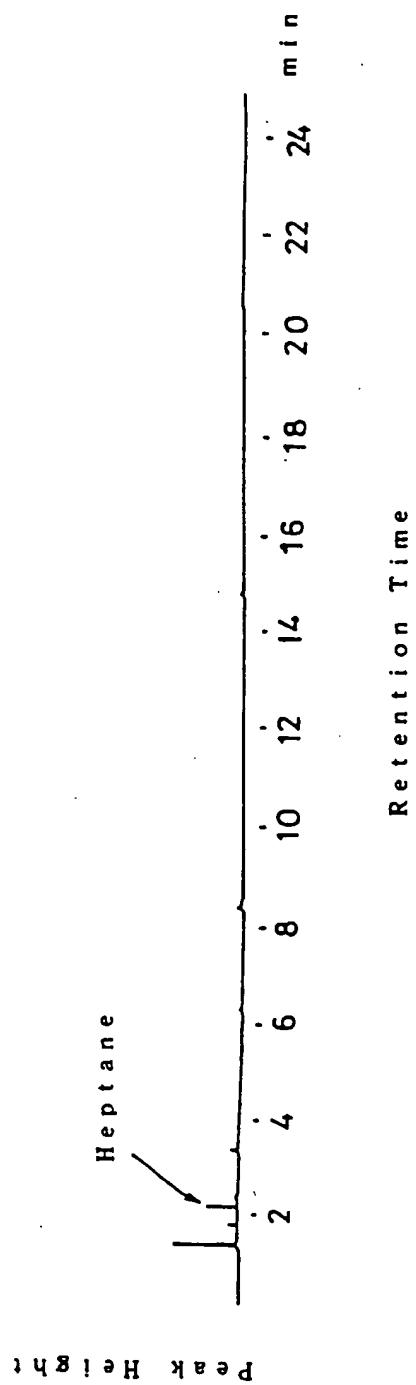


Fig. 1

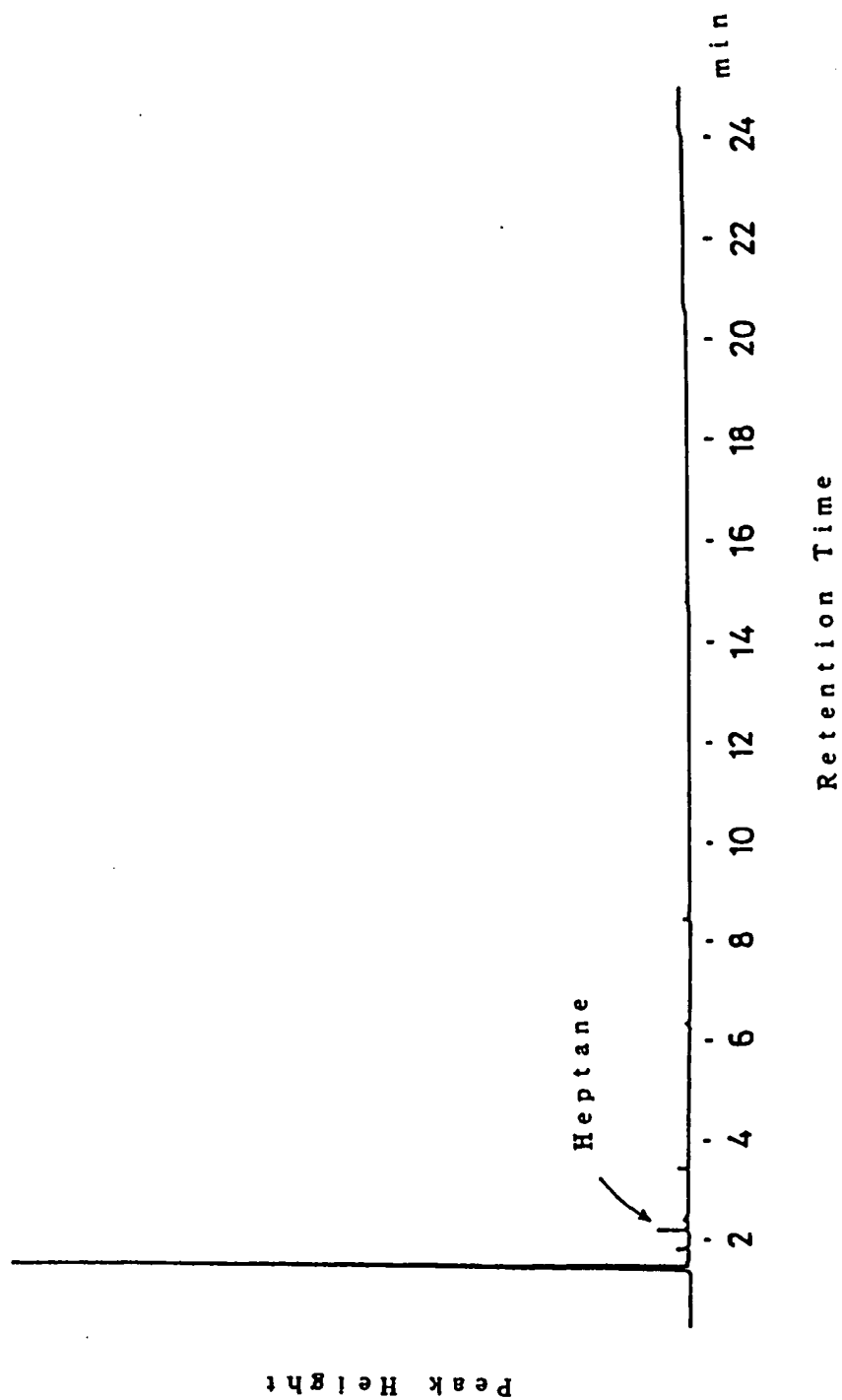


Fig. 2





Fig. 3

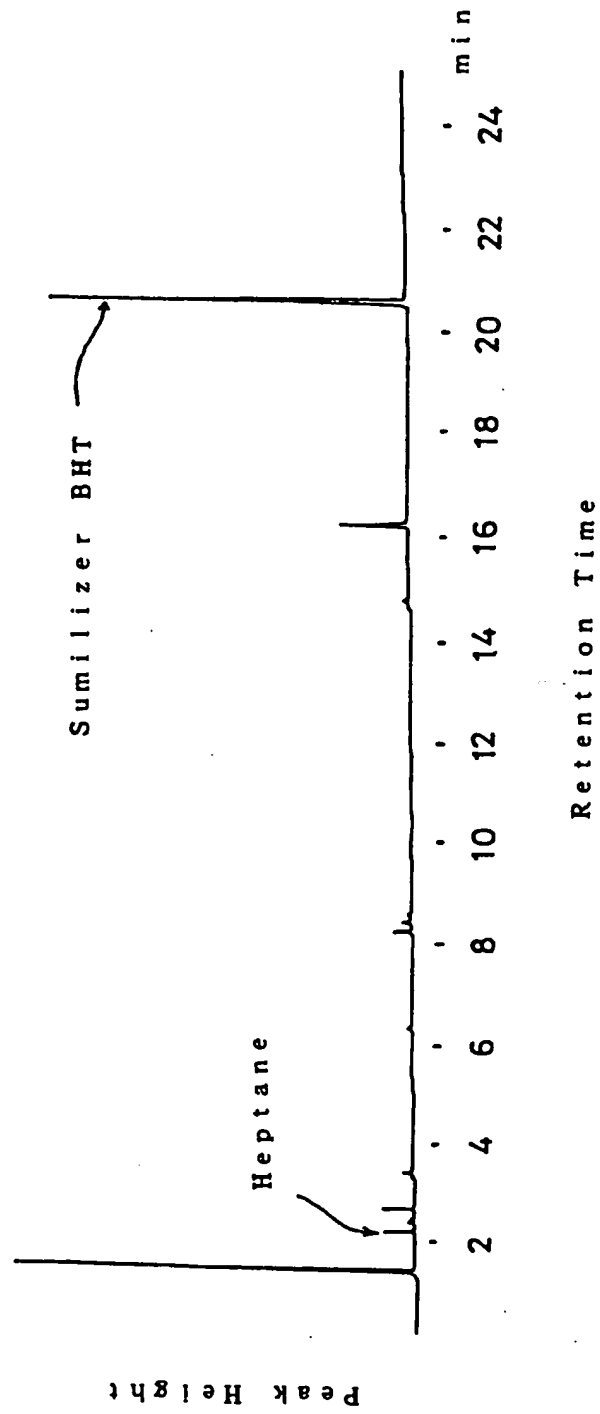


Fig. 4

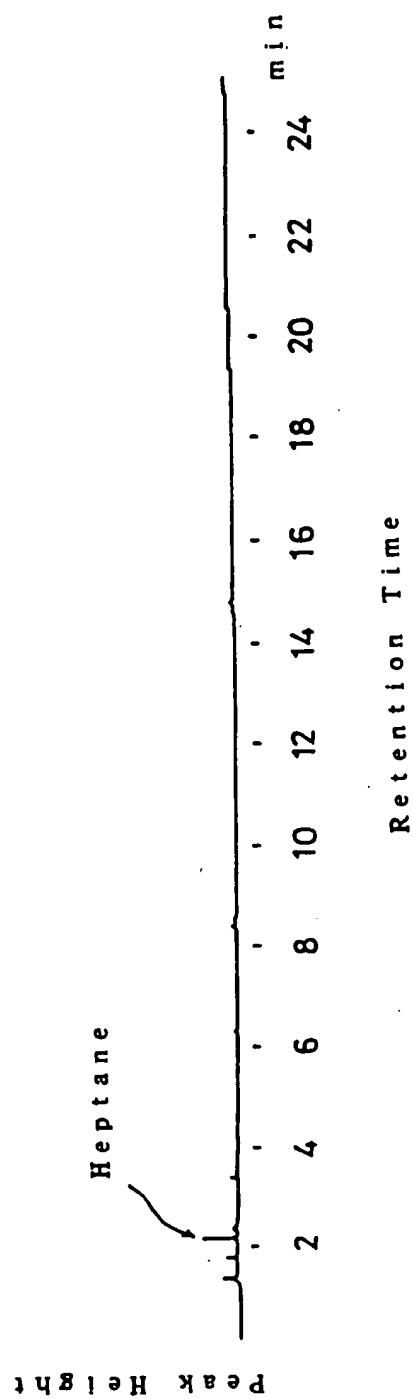


Fig. 5